Reply to the Editor:

We appreciate the comments of Drs Bonde and Graham regarding the surgical management of massive pulmonary embolism. To improve visualization of the pulmonary artery tree, they used cardiopulmonary bypass with aortic clamping and cardioplegia. They reported their experience in 3 patients.

We believe aortic clamping and cardioplegia are not necessary, because reductions in flows have been brief in duration and this has provided adequate visualization in the majority of cases. One problem with their approach will be right ventricular dysfunction. Most patients have some degree of postoperative right ventricular dysfunction, and aortic clamping will certainly make this worse. In our series, several patients demonstrated postoperative right ventricular dysfunction necessitating inotropic support *despite* our practice of avoiding aortic clamping.

In summary, we believe the risks of right ventricular dysfunction imposed by aortic clamping and cardioplegia are greater than the benefits of improved visualization in the occasional case.

John G. Byrne, MD
Marzia Leacche, MD
Department of Cardiac Surgery
Vanderbilt University Medical Center
Nashville, TN 37232-8802
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Assumed oxygen consumption in the determination of cardiac output: Assume carefully . . .

To the Editor:

With great interest we read the article of Fakler and coworkers[1] in which they warn of large errors in determination of cardiac output when using the Fick principle with assumed oxygen consumption (VO_2).[1] We share the concerns of the authors, especially in specific patients with potentially deviating VO_2 compared with a control group, such as children with congenital heart disease.[2,3] However, methodological errors in the study of Fakler and associates may surpass the error introduced by the use of assumed VO_2 in these patients.

Although we hope that our major concern is based on typographical errors, we fear a major flaw in the analysis in this study. According to the described equation in the Methods section, the assumed VO_2 values derived from the LaFarge and Miettinen equations are being divided by body surface area (BSA) to reach indexed values. However, LaFarge and Miettinen[4] derived their equation for indexed VO_2! In other words, the presented equations are incorrect and will lead to highly erroneous values, resulting in false high values in smaller patients (BSA $< 1\ m^2$) and false low values in larger patients (BSA $> 1\ m^2$). In their original study, Lafarge and Miettinen[4] included over 800 patients and found indexed VO_2 values between 112 and 162 $mL \cdot min^{-1} \cdot m^{-2}$. From Figure 4 in the current article, it can be estimated that in this study more than 70% of the $VO_{2LaFarge/Miettinen}$ values are outside this range, whereas the authors claim that the studied patients were in the same age range as the original LaFarge and Miettinen population. This strongly suggests that the authors indeed applied a wrong equation to assume indexed VO_2. In this population with a mean age of 11.3 years, this could be one explanation for the large overestimation of assumed VO_2.

By analyzing indexed values of VO_2 instead of the measured quantity, the authors make it impossible to analyze whether the occurring errors correlate with the absolute magnitude of VO_2. In general, this should be done when comparing measurement methods for accuracy.[3]

Second, it can be questioned whether absolute values of VO_2 determined with the Deltatrac II system (Datex, Engström, Helsinki, Finland) are acceptable as a gold standard. Although this system has been validated in vivo, this was mainly for its use in metabolic studies, requiring accurate and stable respiratory quotients. It has not been well validated for absolute values of VO_2 in mechanically ventilated children, in whom the prevention of air leakage is extremely cumbersome but imperative for accurate measurement of absolute values.

Finally, in contrast to the statement of the authors, in patients with congenital heart defects, adequate values for VO_2 are not necessary for the determination of shunt ratio.

In conclusion, we absolutely agree with the authors that routine use of assumed VO_2 may result in errors in the determination of Fick cardiac output. Unfortunately, we question whether the presented data can be used to support this common opinion.

R. M. F. Berger, MD, PhD
A. Bergstra, BSc
Beatrix Children's Hospital
Department of Pediatrics
Division of Pediatric Cardiology
Thorax Center
University Medical Center Groningen
University of Groningen
Groningen, The Netherlands

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Reply to the Editor:

With great interest we read the comments of Berger and Bergstra, and we appreciate their remarks concerning our article.[1] We have to confirm with regret that there is a typographical error in the published version of our article. The correct version of the LaFarge/ Miettinen formula[2] is as follows:

For females: $VO_2/BSA = (138.1 - 17.04 \times \ln(age) + 0.378 \times HR)\ (mL/min)/m^2$

For males: $VO_2/BSA = (138.1 - 11.49 \times \ln(age) + 0.378 \times HR)\ (mL/min)/m^2$

However, we used this correct version for the analysis of our data, so the data and figures we presented are correct.

The difference between the populations and the regimen of general anesthesia and relaxation might explain the different findings of assumed oxygen consumption (VO_2) values.

Secondly, Berger and Bergstra questioned whether the determination of VO_2 with the Deltatrac II system (Datex, Engström, Helsinki, Finland) is acceptable as a reference method.

Behrends and colleagues[3] showed an acceptably accurate determination of VO_2 using the Deltatrac II system compared with mass spectrometry and wet gas spirometry in an in vitro model for ventilated neonates: mean bias −3.8 % (SD 5.7%).